



European
Commission



Federal Aviation
Administration

A “Gate - To - Gate” Approach to Reducing Aviation’s Environmental Footprint



The United Nations Intergovernmental Panel on Climate Change (IPCC) attributes about 2-3% of global carbon emissions to aviation, an impact which this industry is committed to diminishing as aviation grows. Improving our environmental footprint will be a significant challenge for all of us. Transport activity is expected to increase robustly over the next several decades. Demand for air transportation will continue to grow rapidly to support our economic productivity and quality of life.

We are well aware of aviation's key role in the economic prosperity we today take for granted. The air transportation industry provides 28 million direct, indirect, and induced jobs worldwide. Aircraft carry approximately 40% of the value of all world trade. Last year 2.2 billion people flew on the world's airlines, more passengers than ever before, with predictions of nine billion passengers by 2025. But aviation needs, like all other economic sectors, to continue its contribution against climate change.

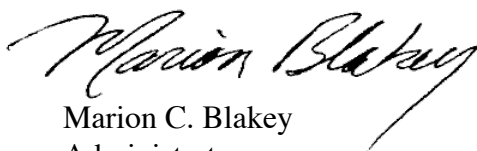
Fortunately, our industry has a long and distinguished record of environmental achievement. Reduced energy consumption and engine emissions are core aviation business principles. Technological advancement has reduced aircraft fuel consumption and emissions significantly over the last 30 years, and this is expected to continue in the future.

In addition, Air Traffic Management initiatives launched by the European Commission and the Federal Aviation Administration (FAA) will shorten flight times, and further reduce fuel consumption and carbon emissions. The overall objective of the Single European Sky ATM Research Program (SESAR) and the U.S. Next Generation Air Transportation System (NextGen) is no less than the transformation of the way airplanes and air traffic are managed. We expect significant results from these efforts, which are part of a global approach towards a sustainable growth in air transport

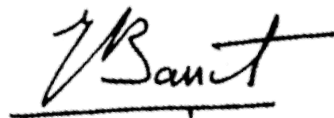
We are pleased to announce the creation of the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) Partnership. Working closely with our government, airline and industry partners we intend to (1) hasten development of operational procedures to reduce aviation's environmental footprint for all phases of flight; (2) accelerate world-wide interoperability of environmentally friendly procedures and standards; (3) capitalize on existing technology and best practices; and (4) provide a systematic approach to ensure appropriate mitigation actions with short, medium and long-term results.

We look forward to validating the benefits of our Partnership with flight trials and demonstrations, beginning this year along principal North Atlantic routes. Join us as we work together toward global harmonization and a greener tomorrow.

Sincerely,



Marion C. Blakey
Administrator



Jacques Barrot
Vice President and Transport Commissioner



Contents

Background	1
US NextGen Capabilities	1
Single European Sky ATM Research Program (SESAR)	2
AIRE Partnership Objectives	3
Gate to Gate Focus	3
Desired Outcomes	5
Our Partners	5

Background

As demand for aviation services continues to grow, we can anticipate an increase in the industry's carbon emissions and noise impacts. This is happening against a backdrop of emission reductions from sources other than aviation, and as well, the rising values we place on environmental quality. If not successfully addressed, environmental issues may significantly constrain air transportation growth in the 21st century.

The Federal Aviation Administration (FAA) and the European Commission (EC) recognize the value of cooperation to achieve global aviation objectives and meet the requirements of all airspace users. The EC and FAA have formed a partnership called the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) to explore opportunities focusing on research, development, and accelerated implementation of environmentally-friendly air traffic standards and procedures.

ATM initiatives launched by these organizations will greatly improve air transportation safety, capacity and efficiency. With regard to environmental impacts, the US Next Generation Air Transportation System (NextGen) and the Single European Sky ATM Research Program (SESAR), will shorten flight times, reduce fuel consumption and engine emissions, and lessen aircraft noise.

US NextGen Capabilities

Initiated in 2003, NextGen will transform the U.S. air transportation system by 2025. NextGen will be more flexible, efficient, and highly automated. It will accommodate up to three times the current transportation demand, while reducing environmental impacts. Aircraft will use information technology with enhanced capabilities in the cockpit, better navigation and landing capabilities, and far more comprehensive and accurate knowledge of weather and traffic conditions in real time. Presently, these NextGen technologies are sufficiently mature to support the AIRE Partnership initiatives:

- **Collaborative Decision Making (CDM):** Collaboration enables stakeholders within the National Airspace System (NAS) and the FAA to exchange information to better analyze, plan and implement real-time operational improvements which increase efficiency and reduce fuel consumption and engine emissions.
- **Traffic Flow Management (TFM):** TFM uses the collaborative process for improved decision making to safely and more efficiently move aircraft into constrained airports and/or around constrained airspace.
- **Automatic Dependent Surveillance (ADS):** Automatic Dependent Surveillance - Contract (ADS-C) is designed to support oceanic aeronautical operations by providing enhanced position information and



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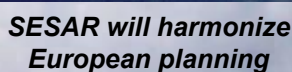
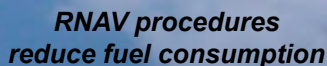
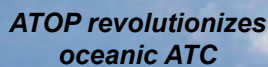
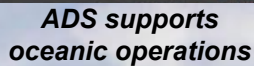
*Air travel is expected to
grow three times by 2025*



*Collaboration improves
system efficiency*



*Traffic Flow Management
is a collaborative process*



- **Advanced Technologies and Oceanic Procedures (ATOP):** Fully implemented in 2007, ATOP revolutionized Oceanic Air Traffic Control (ATC), providing integrated digital data communications and ADS surveillance, automated conflict prediction, and voice-free coordination while automating routine ATC functions. The net result includes separation reductions up to 70 percent and 60 percent improvements in controller response time to aircraft requests.
- **Area Navigation (RNAV):** RNAV procedures reduce fuel consumption and engine emissions through the use of more precise routes, efficient climb and descent profiles, and shorter gate-to-gate ground tracks. When coupled with Required Navigation Performance (RNP), RNAV procedures allow aircraft to use more of the available airspace more efficiently.

SESAR is the European Union's (EU) ATM modernization program. Aimed at sustaining the expected increase in air traffic over the next 20 years, SESAR has ambitious objectives:

- **Greatly increase safety in the European skies**
- **Decrease air traffic management costs by 50 percent**
- **Reduce aviation environmental impacts by 10 percent.**

SESAR is the technological component of the Single European Sky, the EU legislation adopted in 2004 aimed at reducing the fragmentation of European airspace. The Single European Sky was recently extended to cover all 37 States participating in the European Common Aviation Area.

Currently in its definition phase (60M€ project co-funded by the EU and EUROCONTROL), SESAR is being carried out by an industry consortium made up of aviation stakeholders, and led, to a large extent, by airspace user organizations and airline operators.

The SESAR research and development phase (2100M€) will begin shortly. It will be managed by a public-private partnership, the SESAR Joint Undertaking. Created by the EU Council in March 2007, the SESAR Joint Undertaking partnership will be opened up to international participation.

The SESAR deployment phase, expected to start in 2013, includes the operational implementation of procedures, tools and technologies resulting from the previous phases. The concept of operations is based on the ICAO Global ATM Operations Concept and includes the following elements:

- **Business/Mission 4D Trajectory:** The core of new generational systems, 4D business trajectory-based operations enable better prediction and more flexibility in ATM.
- **Shared Information Management Network:** Will enable all users to make decisions based on relevant, accurate, up-to-date information.
- **Improved Airport Operations:** Made possible by improving runway taxi times, better coordination and execution of hub operations, and increased operational support in low visibility conditions.

AIRE Partnership Objectives

Simply put, the FAA and EC seek enhanced ATM interoperability, improved energy efficiency, reduced engine emissions, and lower aircraft noise. These are the AIRE Partnership objectives. Taking advantage of new technologies and air traffic procedures that offer the most immediate, near-term fuel consumption and emission reduction benefits, the AIRE partnership will:

- Hasten development and implementation of environmentally friendly procedures for all phases of flight, from gate to gate;
- Capitalize on gateway airports already using advanced technology and best practices;
- Provide a systematic overall program approach with short, medium and long-term initiatives;
- Validate improvements with flight trials and demonstrations.

Gate to Gate Focus

The AIRE Partnership focus includes all flight segments, beginning with the departure gate and terminating when an aircraft arrives at its destination. Hence, “gate to gate.” We will look at the entire flight, with a “phased approach” to flight demonstration initiatives.

Demonstrations will feature new technologies and procedural improvements which include:



SESAR will eliminate European airspace fragmentation



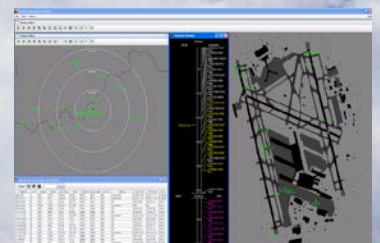
AIRE objectives include reduced emissions



AIRE will highlight improved procedures



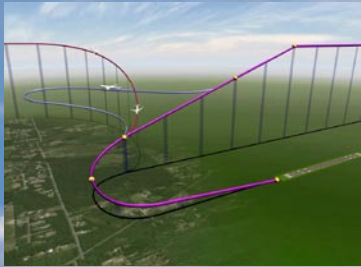
Promising new technologies are available for the pilot



Decision support tools can reduce fuel burn



Trans-Atlantic trajectory optimization offers significant fuel savings



Tailored arrivals can reduce fuel burn, noise and emissions



Global interoperability improves information access



Industry transitioning to net-centric solutions

Trajectory Based Operations (TBO) on the ground: AIRE will leverage promising new technologies to demonstrate the value of collaborative surface operations in maximizing airport throughput while reducing fuel burn and engine emissions. Turbojet aircraft require a significant thrust increase to begin moving from a stop, far in excess of that required to maintain stabilized taxi. Stops and starts, therefore, increase fuel usage and emissions while an aircraft moves on the ground. Trajectory based operations can reduce aircraft stops and starts, with lower overall ground emissions, as well as increase airport surface safety benefits by reducing taxiway conflicts.

New decision support tools will be provided to the ATC tower to support optimal runway usage planning. More efficient surface operations for even just a few flights during busy hours can provide significant delay reductions as well as fuel savings and environmental benefits.

Important environmental improvements on the airport surface can be realized by minimizing aircraft ground run time. When demand exceeds available capacity, significant run time is spent in queues at the runway hold-short line awaiting takeoff clearance. By moving these queues to the gate, or other holding area to which an aircraft could be towed with its engines off, aircraft can be delivered to the hold-short line at the proper time and sequence for takeoff with minimum ground run time.

Collaborative Oceanic Trajectory Optimization: Trajectory collaboration and optimization during Trans-Atlantic flight has the potential for major fuel efficiencies and significant aircraft emission reductions. The concept of trajectory optimization is a key enhancement of NextGen and SESAR, and part of an extensive technology development program over the next decade.

During the AIRE initiative, U.S. and European air navigation service providers and industry partners will demonstrate collaborative trajectory optimization in the oceanic environment, initially using a manual optimization process. Automated profile optimization tools will be included as these become available.

Tailored Arrivals: The Tailored Arrival is a comprehensive trajectory based arrival clearance to a destination airport. It is a low power, continuous descent approach designed to reduce fuel burn, noise and emissions. Ground based systems calculate the aircraft's four dimensional (4D) arrival profile including flight path, vertical profile and speed/time based on profile optimization adjusted for arrival constraints. The arrival profile is data-linked to the aircraft, where it is auto-loaded into the aircraft Flight Management System. The profile is confirmed via voice clearance in the radar environment and executed by the onboard guidance system with little additional cockpit modification required. Early field trials indicate that tailored arrivals could save between 400 and 800 pounds of fuel per flight.

Global System-Wide, Real-Time Information Management Data Sharing

Important facets of global, interoperable ATM include open, flexible and secure information management and data sharing. AIRE Partnership demonstrations will facilitate the international conveyance of flight critical information, including surveillance, weather, flight planning, navigation, and traffic flow data, among interested air navigation service providers and airlines. This is a recognized international civil aviation objective. The FAA and EC are committed to an industry transition toward a scalable, standards-based network architecture that seamlessly and securely connects users with the flight information they need.

Desired Outcomes

AIRE will conduct a structured flight demonstration program to explore the potential environmental benefits of new aviation technologies and improved operational procedures. Near and longer term outcomes are anticipated that will lead to implementation of proven technologies and procedures, and subsequently, shorter flight time averages, significant industry fuel savings, and commensurate engine emission reductions. Desired partnership outcomes include:

- **Near Term**
 - Coordinate interoperability demonstrations
 - Validate environmental improvements
- **Mid Term**
 - Conduct joint interoperability demonstrations
 - Establish business case and safety analysis
 - Produce unified aviation standards
 - Finalize environmental impact analysis
- **Long Term**
 - Implement improved procedures
 - Adopt new technologies

Our Partners

The FAA and EC look forward to working closely with our air navigation service provider, airline and industry partners on the AIRE Trans-Atlantic flight demonstration initiatives. We anticipate that over time, our partnership will grow. Current partners include:

- **Air Navigation Service Providers** - FAA, IAA (Ireland), LFV Sweden, NAV Portugal
- **Airlines** - Delta Air Lines, Air France, KLM, SAS, Virgin Atlantic, FedEx
- **Industry** - Boeing, Airbus, United Parcel Service

